

SEQUENCE LISTING

(1) GENERAL INFORMATION:

(i) APPLICANT:

(A) NAME: Rijksuniversiteit Leiden
(B) STREET: Stationsweg 46
(C) CITY: Leiden
(D) STATE: Zuid-Holland
(E) COUNTRY: the Netherlands
(F) POSTAL CODE (ZIP): 2312 AV

(A) NAME: Nederlandse Organisatie voor Wetenschappelijk
Onderzoek/Chemische Wetenschappen/STW
(B) STREET: Laan van Nieuw Oost Indie 131
(C) CITY: The Hague
(D) STATE: Zuid-Holland
(E) COUNTRY: the Netherlands
(F) POSTAL CODE (ZIP): 2593 BM

(ii) TITLE OF INVENTION: Reducing branching and enhancing
fragmentation in culturing filamentous microorganisms.

(iii) NUMBER OF SEQUENCES: 13

(iv) COMPUTER READABLE FORM:

(A) MEDIUM TYPE: Floppy disk
(B) COMPUTER: IBM PC compatible
(C) OPERATING SYSTEM: PC-DOS/MS-DOS
(D) SOFTWARE: PatentIn Release #1.0, Version #1.30 (EPO)

(v) CURRENT APPLICATION DATA:

PRIORITY APPLICATION NUMBER : EP 98202148.7

(2) INFORMATION FOR SEQ ID NO: 1:

(i) SEQUENCE CHARACTERISTICS:

(A) LENGTH: 438 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: double
(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(iii) HYPOTHETICAL: NO

(vi) Original Source: (A) Organism: Streptomyces griseus
(B) Strain: ATTC 23345

(ix) FEATURE:

(A) NAME/KEY: CDS
(B) LOCATION: 1..408
(D) OTHER INFORMATION: /product= "SsgA"
/gene= "ssgA"

(xi) SEQUENCE DESCRIPTION: SEQ ID NO: 1:

ATGCGCGAGT CGGTTCAAGC AGAGGTCATG ATGAGCTTCC TCGTCTCCGA GGAGCTCTCG
60

TTCCGTATTC CGGTGGAGCT CCGATACGAG GTCGGCGATC CGTATGCCAT CCGGATGACG
120

TTCCACCTTC CCGGCGATGC CCCTGTGACC TGGGCGTTTC GCCGCGAGCT GCTGCTGGAC
180

GGGCTCAACA GCCCAGCGG CGACGGCGAT GTGCACATCG GCCCAGCCGA GCCCAGGGG
240

CTCGGAGATG TCCACATCCG GCTCCAGGTC GGCGCGGACC GTGCGCTGTT CCGGGCGGGG
300

ACGGCACCGC TGGTGGCGTT CCTCGACCGG ACGGACAAGC TCGTGCCGCT CGGCCAGGAG
360

CACACGCTGG GTGACTTCGA CGGCAACCTG GAGGACGCAC TGGGCCGCAT CCTCGCCGAG
420

GAGCAGAACG CCGGCTGA
438

(2) INFORMATION FOR SEQ ID NO: 2:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 408 base pairs
- (B) TYPE: nucleic acid
- (C) STRANDEDNESS: double
- (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(iii) HYPOTHETICAL: NO

(vi) ORIGINAL SOURCE:

- (A) ORGANISM: *Streptomyces griseus*
- (B) STRAIN: ATTC 23345

(ix) FEATURE:

- (A) NAME/KEY: CDS
- (B) LOCATION: 1..408
- (D) OTHER INFORMATION: /product= "SsgA"
/gene= "ssgA"

(xi) SEQUENCE DESCRIPTION: SEQ ID NO: 2:

ATG AGC TTC CTC GTC TCC GAG GAG CTC TCG TTC CGT ATT CCG GTG GAG
48

Met Ser Phe Leu Val Ser Glu Glu Leu Ser Phe Arg Ile Pro Val Glu
1 5 10 15

CTC CGA TAC GAG GTC GGC GAT CCG TAT GCC ATC CGG ATG ACG TTC CAC
96

Leu Arg Tyr Glu Val Gly Asp Pro Tyr Ala Ile Arg Met Thr Phe His
20 25 30

CTT CCC GGC GAT GCC CCT GTG ACC TGG GCG TTC GGC CGC GAG CTG CTG
144

Leu Pro Gly Asp Ala Pro Val Thr Trp Ala Phe Gly Arg Glu Leu Leu
35 40 45

CTG GAC GGG CTC AAC AGC CCG AGC GGC GAC GGC GAT GTG CAC ATC GGC
192

Leu Asp Gly Leu Asn Ser Pro Ser Gly Asp Gly Asp Val His Ile Gly
50 55 60

CCG ACC GAG CCC GAG GGC CTC GGA GAT GTC CAC ATC CGG CTC CAG GTC

240
 Pro Thr Glu Pro Glu Gly Leu Gly Asp Val His Ile Arg Leu Gln Val
 65 70 75 80

GGC GCG GAC CGT GCG CTG TTC CGG GCG GGG ACG GCA CCG CTG GTG GCG
 288
 Gly Ala Asp Arg Ala Leu Phe Arg Ala Gly Thr Ala Pro Leu Val Ala
 85 90 95

TTC CTC GAC CGG ACG GAC AAG CTC GTG CCG CTC GGC CAG GAG CAC ACG
 336
 Phe Leu Asp Arg Thr Asp Lys Leu Val Pro Leu Gly Gln Glu His Thr
 100 105 110

CTG GGT GAC TTC GAC GGC AAC CTG GAG GAC GCA CTG GGC CGC ATC CTC
 384
 Leu Gly Asp Phe Asp Gly Asn Leu Glu Asp Ala Leu Gly Arg Ile Leu
 115 120 125

GCC GAG GAG CAG AAC GCC GGC TG
 408
 Ala Glu Glu Gln Asn Ala Gly
 130 135

(2) INFORMATION FOR SEQ ID NO: 3:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 135 amino acids
- (B) TYPE: amino acid
- (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO: 3:

Met Ser Phe Leu Val Ser Glu Glu Leu Ser Phe Arg Ile Pro Val Glu
 1 5 10 15

Leu Arg Tyr Glu Val Gly Asp Pro Tyr Ala Ile Arg Met Thr Phe His
 20 25 30

Leu Pro Gly Asp Ala Pro Val Thr Trp Ala Phe Gly Arg Glu Leu Leu
 35 40 45

Leu Asp Gly Leu Asn Ser Pro Ser Gly Asp Gly Asp Val His Ile Gly
 50 55 60

Pro Thr Glu Pro Glu Gly Leu Gly Asp Val His Ile Arg Leu Gln Val
 65 70 75 80

Gly Ala Asp Arg Ala Leu Phe Arg Ala Gly Thr Ala Pro Leu Val Ala
 85 90 95

Phe Leu Asp Arg Thr Asp Lys Leu Val Pro Leu Gly Gln Glu His Thr
 100 105 110

Leu Gly Asp Phe Asp Gly Asn Leu Glu Asp Ala Leu Gly Arg Ile Leu
 115 120 125

Ala Glu Glu Gln Asn Ala Gly
 130 135

(2) INFORMATION FOR SEQ ID NO: 4:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 408 base pairs
- (B) TYPE: nucleic acid
- (C) STRANDEDNESS: double
- (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(iii) HYPOTHETICAL: NO

(vi) ORIGINAL SOURCE:

- (A) ORGANISM: *Streptomyces albus* G
- (B) STRAIN: ATCC 3004

(ix) FEATURE:

- (A) NAME/KEY: CDS
- (B) LOCATION: 1..408
- (D) OTHER INFORMATION: /product= "SsgA"
/gene= "ssgA"

(xi) SEQUENCE DESCRIPTION: SEQ ID NO: 4:

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ATG AGC TTC CTC GTC TCC GAG GAG CTC GCC TTC CGC ATC CCG GTG GAG
48
Met Ser Phe Leu Val Ser Glu Glu Leu Ala Phe Arg Ile Pro Val Glu
  1             5             10             15

CTG CGG TAC GAG ACC GTC GAT CCG TAC GCG GTG CGG CTG ACG TTC CAC
96
Leu Arg Tyr Glu Thr Val Asp Pro Tyr Ala Val Arg Leu Thr Phe His
      20             25             30

CTC CCC GGA GAC GCC CCG GTC ACC TGG GTC TTC GGG CGT GAA CTG CTG
144
Leu Pro Gly Asp Ala Pro Val Thr Trp Val Phe Gly Arg Glu Leu Leu
      35             40             45

GTC GAG GGA GTC CTG GAC GCC GCG GGC GAC GGC GAC GTC CGG GTC TGC
192
Val Glu Gly Val Leu Asp Ala Ala Gly Asp Gly Asp Val Arg Val Cys
      50             55             60

CCG GTG GGG CAG ACG GCC ACC AGG GAG GTG CAC ATC ACC CTC CAG GTC
240
Pro Val Gly Gln Thr Ala Thr Arg Glu Val His Ile Thr Leu Gln Val
      65             70             75             80

GGC TCC GAG CAG GCG CTC TTC CGC GTC GGC AAG GCG CCG CTG CTC GCC
288
Gly Ser Glu Gln Ala Leu Phe Arg Val Gly Lys Ala Pro Leu Leu Ala
      85             90             95

TTC CTC GAC CGC ACC GAC CAG GGC TTG TCG CTC GGC AGC GAG CGG GCA
336
Phe Leu Asp Arg Thr Asp Gln Gly Leu Ser Leu Gly Ser Glu Arg Ala
      100            105            110

CAC GCC GAC TTC GAC AGC CAC CTC GAC GAC GCT CTG AAC CGC AGC CTC
384
His Ala Asp Phe Asp Ser His Leu Asp Asp Ala Leu Asn Arg Ser Leu
      115            120            125

GCC GAG GAG CAG AGC GCC GGC TG
408
Ala Glu Glu Gln Ser Ala Gly

```

130

135

(2) INFORMATION FOR SEQ ID NO: 5:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 135 amino acids
- (B) TYPE: amino acid
- (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO: 5:

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Met Ser Phe Leu Val Ser Glu Glu Leu Ala Phe Arg Ile Pro Val Glu
 1              5              10              15
Leu Arg Tyr Glu Thr Val Asp Pro Tyr Ala Val Arg Leu Thr Phe His
          20              25              30
Leu Pro Gly Asp Ala Pro Val Thr Trp Val Phe Gly Arg Glu Leu Leu
          35              40              45
Val Glu Gly Val Leu Asp Ala Ala Gly Asp Gly Asp Val Arg Val Cys
          50              55              60
Pro Val Gly Gln Thr Ala Thr Arg Glu Val His Ile Thr Leu Gln Val
          65              70              75              80
Gly Ser Glu Gln Ala Leu Phe Arg Val Gly Lys Ala Pro Leu Leu Ala
          85              90              95
Phe Leu Asp Arg Thr Asp Gln Gly Leu Ser Leu Gly Ser Glu Arg Ala
          100             105             110
His Ala Asp Phe Asp Ser His Leu Asp Asp Ala Leu Asn Arg Ser Leu
          115             120             125
Ala Glu Glu Gln Ser Ala Gly
          130             135

```

(2) INFORMATION FOR SEQ ID NO: 6:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 408 base pairs
- (B) TYPE: nucleic acid
- (C) STRANDEDNESS: double
- (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(iii) HYPOTHETICAL: NO

(vi) ORIGINAL SOURCE:

- (A) ORGANISM: Streptomyces goldiniensis
- (B) STRAIN: ATCC 21386

(ix) FEATURE:

- (A) NAME/KEY: CDS
- (B) LOCATION: 1..408
- (D) OTHER INFORMATION: /product= "SsgA"
/gene= "ssgA"

(xi) SEQUENCE DESCRIPTION: SEQ ID NO: 6:

ATG AGC TTC CTC GTC TCG GAA GAA CTC TCC TTC CGT ATT CCG GTG GAG
 48
 Met Ser Phe Leu Val Ser Glu Glu Leu Ser Phe Arg Ile Pro Val Glu
 1 5 10 15
 CTG CGT TAC GAG ACC TGT GAT CCC TAC GCC GTG CGG CTG ACC TTT CAT
 96
 Leu Arg Tyr Glu Thr Cys Asp Pro Tyr Ala Val Arg Leu Thr Phe His
 20 25 30
 CTG CCC GGA GAT GCC CCG GTG ACC TGG GCG TTC GGG CGG GAG TTG CTC
 144
 Leu Pro Gly Asp Ala Pro Val Thr Trp Ala Phe Gly Arg Glu Leu Leu
 35 40 45
 ATC GAC GGA GGT CCG CGG CCG TGC GGG GAC GGG GAC GTC CAC ATC GCG
 192
 Ile Asp Gly Gly Pro Arg Pro Cys Gly Asp Gly Asp Val His Ile Ala
 50 55 60
 CCC GCC GAC CCG GAG ACG TTC GGC GAG GTC CTG ATC CGC CTG CAG GTG
 240
 Pro Ala Asp Pro Glu Thr Phe Gly Glu Val Leu Ile Arg Leu Gln Val
 65 70 75 80
 GGG AGC GAC CAG GCG ATG TTC CCG GTC GGC ACG GCG CCG CTG GTG GCC
 288
 Gly Ser Asp Gln Ala Met Phe Arg Val Gly Thr Ala Pro Leu Val Ala
 85 90 95
 TTC CTG GAC CGC ACG GAC AAG ATC GTG CCG CTG GGG CAG GAG CGT TCC
 336
 Phe Leu Asp Arg Thr Asp Lys Ile Val Pro Leu Gly Gln Glu Arg Ser
 100 105 110
 CTC GCC GAC TTC GAC GCC CTG CTC GAC GAG GCG CTG GAC CGC ATC CTG
 384
 Leu Ala Asp Phe Asp Ala Leu Leu Asp Glu Ala Leu Asp Arg Ile Leu
 115 120 125
 GCC GAG GAG CAG AAC GCC GGC TG
 408
 Ala Glu Glu Gln Asn Ala Gly
 130 135

(2) INFORMATION FOR SEQ ID NO: 7:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 135 amino acids
- (B) TYPE: amino acid
- (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO: 7:

Met Ser Phe Leu Val Ser Glu Glu Leu Ser Phe Arg Ile Pro Val Glu
 1 5 10 15
 Leu Arg Tyr Glu Thr Cys Asp Pro Tyr Ala Val Arg Leu Thr Phe His
 20 25 30
 Leu Pro Gly Asp Ala Pro Val Thr Trp Ala Phe Gly Arg Glu Leu Leu
 35 40 45

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Ile Asp Gly Gly Pro Arg Pro Cys Gly Asp Gly Asp Val His Ile Ala
  50                      55                      60
Pro Ala Asp Pro Glu Thr Phe Gly Glu Val Leu Ile Arg Leu Gln Val
  65                      70                      75                      80
Gly Ser Asp Gln Ala Met Phe Arg Val Gly Thr Ala Pro Leu Val Ala
                      85                      90                      95
Phe Leu Asp Arg Thr Asp Lys Ile Val Pro Leu Gly Gln Glu Arg Ser
          100                      105                      110
Leu Ala Asp Phe Asp Ala Leu Leu Asp Glu Ala Leu Asp Arg Ile Leu
          115                      120                      125
Ala Glu Glu Gln Asn Ala Gly
          130                      135

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(2) INFORMATION FOR SEQ ID NO: 8:

- (i) SEQUENCE CHARACTERISTICS:
 - (A) LENGTH: 408 base pairs
 - (B) TYPE: nucleic acid
 - (C) STRANDEDNESS: double
 - (D) TOPOLOGY: linear
- (ii) MOLECULE TYPE: DNA (genomic)
- (iii) HYPOTHETICAL: NO
- (vi) ORIGINAL SOURCE:
 - (A) ORGANISM: Streptomyces netropsis
 - (B) STRAIN: ATCC 23940
- (ix) FEATURE:
 - (A) NAME/KEY: CDS
 - (B) LOCATION: 1..408
 - (D) OTHER INFORMATION: /product= "SsgA"
 - /gene= "ssgA"

(xi) SEQUENCE DESCRIPTION: SEQ ID NO: 8:

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ATG AGC TTC CTC GTC TCC GAG GAG CTC TCC TTC AAG ATC CCA GTC GAA
48
Met Ser Phe Leu Val Ser Glu Glu Leu Ser Phe Lys Ile Pro Val Glu
  1                      5                      10                      15
CTG CGA TAC GAG ACC CGG GAT CCC TAC GCG GTG CGG ATG ACC TTC CAC
96
Leu Arg Tyr Glu Thr Arg Asp Pro Tyr Ala Val Arg Met Thr Phe His
          20                      25                      30
CTC CCC GGA GAC GCG CCT GTG ACC TGG GCG TTC GGC CGG GAG CTG CTG
144
Leu Pro Gly Asp Ala Pro Val Thr Trp Ala Phe Gly Arg Glu Leu Leu
          35                      40                      45
CTC GAC GGG ATC AAC CGC CCG AGC GGC GAC GGC GAC GTC CAC ATC GCC
192
Leu Asp Gly Ile Asn Arg Pro Ser Gly Asp Gly Asp Val His Ile Ala
          50                      55                      60
CCG ACC GAC CCC GAG GGC CTG TCG GAC GTC TCC ATC CGG CTC CAG GTG

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240
 Pro Thr Asp Pro Glu Gly Leu Ser Asp Val Ser Ile Arg Leu Gln Val
 65 70 75 80

GGC GCG GAC CGC GCC CTC TTC CGT GCA GGC GCC CCG CCG CTG GTC GCC
 288
 Gly Ala Asp Arg Ala Leu Phe Arg Ala Gly Ala Pro Pro Leu Val Ala
 85 90 95

TTC CTC GAC CGC ACG GAC AAG TCG GTG CCG CTC GGT CAG GAA CAG ACT
 336
 Phe Leu Asp Arg Thr Asp Lys Ser Val Pro Leu Gly Gln Glu Gln Thr
 100 105 110

CTG GGT GAC TTC GAG GAC AGC CTG GAG GCC GCG CTC GGC AAG ATC CTC
 384
 Leu Gly Asp Phe Glu Asp Ser Leu Glu Ala Ala Leu Gly Lys Ile Leu
 115 120 125

GCC GAG GAG CAG AAC GCC GGC TG
 408
 Ala Glu Glu Gln Asn Ala Gly
 130 135

(2) INFORMATION FOR SEQ ID NO: 9:

(i) SEQUENCE CHARACTERISTICS:

(A) LENGTH: 135 amino acids

(B) TYPE: amino acid

(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO: 9:

Met Ser Phe Leu Val Ser Glu Glu Leu Ser Phe Lys Ile Pro Val Glu
 1 5 10 15

Leu Arg Tyr Glu Thr Arg Asp Pro Tyr Ala Val Arg Met Thr Phe His
 20 25 30

Leu Pro Gly Asp Ala Pro Val Thr Trp Ala Phe Gly Arg Glu Leu Leu
 35 40 45

Leu Asp Gly Ile Asn Arg Pro Ser Gly Asp Gly Asp Val His Ile Ala
 50 55 60

Pro Thr Asp Pro Glu Gly Leu Ser Asp Val Ser Ile Arg Leu Gln Val
 65 70 75 80

Gly Ala Asp Arg Ala Leu Phe Arg Ala Gly Ala Pro Pro Leu Val Ala
 85 90 95

Phe Leu Asp Arg Thr Asp Lys Ser Val Pro Leu Gly Gln Glu Gln Thr
 100 105 110

Leu Gly Asp Phe Glu Asp Ser Leu Glu Ala Ala Leu Gly Lys Ile Leu
 115 120 125

Ala Glu Glu Gln Asn Ala Gly
 130 135

(2) INFORMATION FOR SEQ ID NO: 10:

- (i) SEQUENCE CHARACTERISTICS:
 - (A) LENGTH: 34 nucleotides
 - (B) TYPE: nucleic acid
 - (C) STRANDEDNESS: single
 - (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (synthetic)

- (vi) ORIGINAL SOURCE:
 - (C) INDIVIDUAL PRODUCT: ssg1

(xi) SEQUENCE DESCRIPTION: SEQ ID NO: 10:

GGCGAATTCG AACAGCTACG TGGCGAAGTC GCCA
34

(2) INFORMATION FOR SEQ ID NO: 11:

- (i) SEQUENCE CHARACTERISTICS:
 - (A) LENGTH: 32 nucleotides
 - (B) TYPE: nucleic acid
 - (C) STRANDEDNESS: single
 - (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (synthetic)

- (vi) ORIGINAL SOURCE:
 - (C) INDIVIDUAL PRODUCT: ssg2

(xi) SEQUENCE DESCRIPTION: SEQ ID NO: 11:

GTGGGATCCG TGCTCGCGGC GCTGGTCGTC TC
32

(2) INFORMATION FOR SEQ ID NO: 12:

- (i) SEQUENCE CHARACTERISTICS:
 - (A) LENGTH: 32 nucleotides
 - (B) TYPE: nucleic acid
 - (C) STRANDEDNESS: single
 - (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (synthetic)

- (vi) ORIGINAL SOURCE:
 - (C) INDIVIDUAL PRODUCT: ssg3

(xi) SEQUENCE DESCRIPTION: SEQ ID NO: 12:

GGGAATTCCA TATGCGCGAG TCGGTTCAAG CA
32

(2) INFORMATION FOR SEQ ID NO: 13:

- (i) SEQUENCE CHARACTERISTICS:
 - (A) LENGTH: 25 nucleotides
 - (B) TYPE: nucleic acid

(C) STRANDEDNESS: single
(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(vi) ORIGINAL SOURCE:

(C) INDIVIDUAL PRODUCT: ssg4

(xi) SEQUENCE DESCRIPTION: SEQ ID NO: 13:

CCGGTCAGCC GCGTTCTGC TCCTC

25